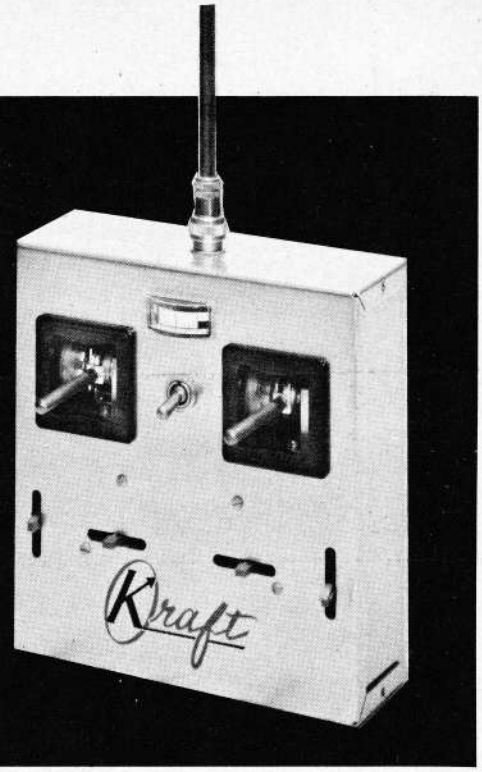
THE AGE OF PROPORTIONAL . . . . .

KRAFT PROPORTIONAL SYSTEM



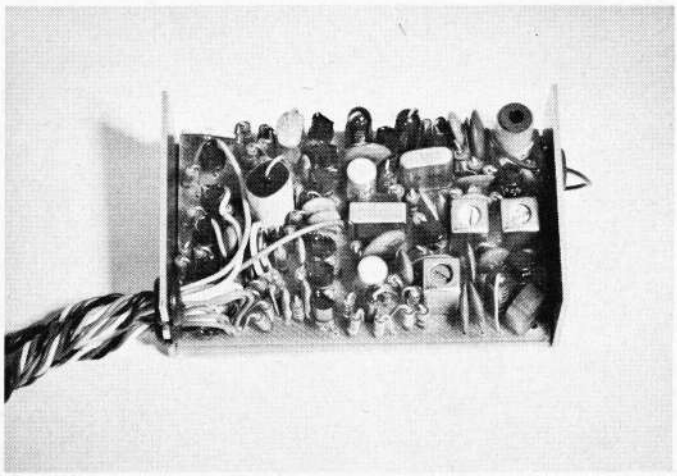
A NEW CONCEPT AND A NEW STANDARD

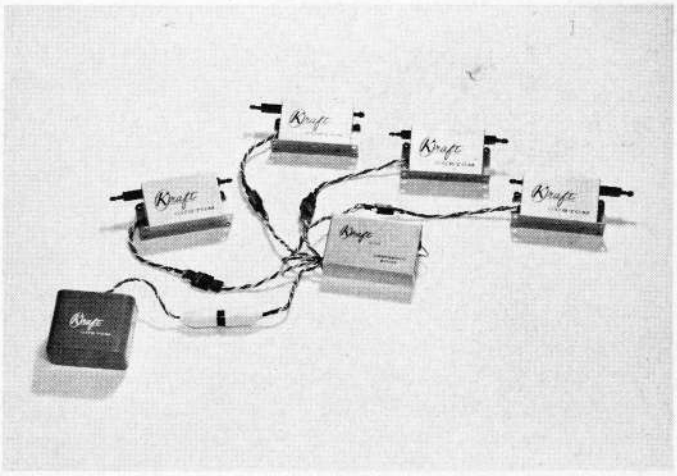
Scheduled for full production after January 1st, the new Kraft quad proportional system represents, in our opinion, a major breakthrough in the field of proportional control. Although in no way similar to the earlier Kraft-Pullen proportional system, the new model, designed by Don Mathes, is a joint production engineering effort of Phil Kraft, Don Mathes, and Jerry Pullen, and represents an accumulative experience factor of twelve years in the field of proportional control.

With a pilot production run of twenty-five units now in process, we were fortunate enough to flight test one of these new models, using the 'Digester' design featured in this issue. To say that this was a new experience in proportional flying would be an understatement. From first appearance through a full day's flying it was apparent that we were working with an entirely new concept in this comparatively new realm of radio control.

Basically, the Kraft proportional system consists of a four-channel, "digital" system which enables the flyer to obtain full control of rudder, elevator, aileron, motor, plus indvidual trim of all functions. For all intents and purposes, the completely pre-wired and pre-cabled airborne installation looks exactly like a reed installation. In fact, the entire proportional receiver is enclosed in the standard Kraft ten-channel receiver case. The battery pack is the standard size of the ten-channel system. The four servos, with self-contained closed loop amplifiers, are between the Ann-co and Bonner in physical size, and feature completely linear travel. The Kraft proportional servos put out approximately three pounds of thrust with a total linear travel of 5/8". A continuous position repeat is accurate to one-half to one percent of total travel! Trim is equivalent to ten percent of the total travel. Unlike the majority of proportional systems available today, trim is used only for first-flight convenience. Once the model is properly trimmed out, only elevator trim is used. Unlike some competitive proportional rigs it is not necessary to re-trim due to environmental variations. This major advantage of the Kraft system is due to the fact that there is absolutely **no** drift whatsoever over the complete temperature range. Environmental changes have absolutely no effect upon the centering which remains constant.

The transmitter is a two-stick sys-



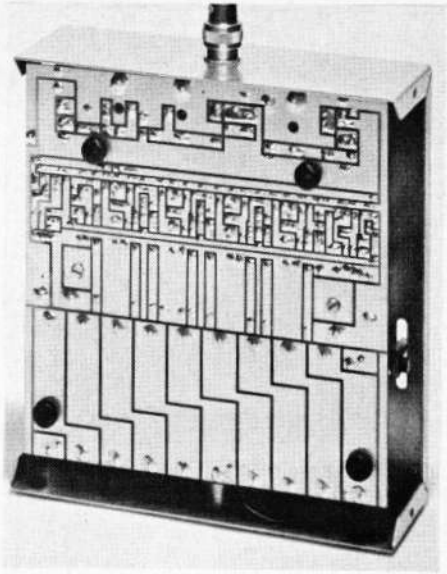


tem, factory set-up with control functions located as desired by the purchaser. The normal stick function has the elevator and aileron on one stick with the rudder and motor on the other. With this method, the flier is for all intents and purposes, flying a single stick system. Although the final transmitter power supply configuration has not yet been established, our model was equipped with nickel cadmium batteries (600 Mah pencells) and a charging socket at the base of the transmitter itself.

The new Kraft quad proportional is unique in many ways and will undoubtedly set a design precedent for proportional systems of the future. The most noticeable difference from competitive systems is the overall simplicity. Since it is a known fact that proportional problems or failures increase as the number of components are increased, it is interesting to note that this new quad system uses approximately 50% of the components used in the original Kraft-Pullen design — and less than any competitive system currently available. This inherent design simplicity not only provides the flier with an increased reliability potential, but is also a major asset to the manufacturer from the standpoint of production. With respect to the latter, this system is what is known as "repeatable" — that is to say, each unit manufactured will be exactly like the one before it, and will perform in the same manner. To date, the majority of proportional rigs are, in effect, "custom" units. With regard to the components used, the new proportional receiver uses only seventeen transistors. The relationship of potential failure to the number of components used is a known mathematical equation — double the number of components and you have four times the trouble.

Another notable difference in the Kraft system is the complete absence of "lockout" and "fail-safe". As the current controversy goes on as to what form of fail-safe should be incorporated in proportional systems, we were quite surprised to find a system that does not utilize this principle at all. After a thorough analysis of this problem, however, it becomes apparent that there are two sides to the question.

As an example, when erroneous, or "outside" information such as interference, is received by most proportional receivers, the receiver will "lock out" — that is to say, they remain for a brief period at the last given command, then go to "fail-safe", in most cases, neutral. This then, describes an inability of the system to discriminate between, or reject information other than that transmitted by the pilot, thereby causing the pilot to lose control over the ship. The new



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KRAFT PROPORTIONAL

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Kraft system, in this given situation, is much the same as a reed rig. Interference will cause the surfaces to chatter slightly, but the pilot can still control the surfaces through the interference. Prolonged massive interference, again as with any system, will cause a "prang".

Let's take a look at how this might affect the pilot. It is a known fact that modern day multi designs will only fly a very, very short way without control by the pilot. Take any top design, such as the Candy or Kwik-Fli, whether reeds or proportional, then neutralize the surfaces by shutting off the transmitter and see how far it will fly before going into the deck! This, then renders a failsafe system rather useless, unless of course, you're flying a full-house Super Buccaneer! Assuming a vertical dive, for example, if interference is interjected and a failsafe occurs, you'd go right on in. With the Kraft system, the surfaces would chatter, but you would retain enough control to "fly through" the interference and recover from the dive. With the Kraft concept, the RF is so solid and well developed that "lockout" is unnecessary.

The new Kraft proportional system is the result of several years of work in proportional guidance systems, and the seventh design to be considered and tested by this concern. Phil Kraft has stated repeatedly that they would not release a proportional system into general production for the purpose of letting the consumer field prove (or disprove) the feasibility fo a given design. Only when they were satisfied with the total reliability and performance of their proportional system would it be manufactured and made available through franchised Kraft dealer, according to Don Mathes, Chief Engineer.

This design seems to be "it". After thoroughly flight testing this system, and after observing several of these systems in continuous operation, in the air, we have made the statement that a proportional system is avail-

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able with the reliability of a top reed rig, yet with the fine, discriminating performance to be expected of proportional control. During the days we flew this system in the Mathes 'Digester' design, we simply plugged in the battery pack and flew. Conrol response was precise and exact. All tests were conducted in the interference cluttered metropolitan Los Angeles area, yet no interference problems were encountered. Reed systems and other Kraft proportional prototypes flying simultaneously on adjacent channels provided no interference problems whatsoever. Temperature changes had no effect on servo response. There was no servo drift or deadband. Outside of elevator trim, it was not necessary to use the trim functions at all. At the end of each day's flying session, the battery pack was recharged, and we were ready for another day's flying. It was as simple as that.

When we asked Phil Kraft for his opinion as to a reliability comparison between the new system and his standard ten or twelve channel reed rigs, he replied, simply: "When you consider the installation, usage, and reed maintenance in the hands of the average flier, the new proportional system is equally as reliable as a reed system, if not more so."

We are truly standing on the threshold of the age of proportional control. We are proud to present this basic flight review of the new Kraft system. Since it will not be available until shortly after January 1st, 1965, and since it does represent several new and unique engineering design concepts, we have not presented a laboratory analysis of this system. Rather, we have presented a basic flight report and some of our own opinions concerning the system.

The manufacturer of the Kraft proportional system is Kraft Custom Radio, 2519 Lee St., South El Monte, California. Available through Kraft franchised dealers on or about January 1. Price: Under $600.
